Remote Measurements of Stratospheric Composition by Balloon-borne FTIR Solar Absorption Spectrometry.

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The MkIV Interferometer, a high resolution Fourier transform spectrometer built at JPL, for remote atmospheric measurements, has made 5 successful mid-latitude (35°N) balloon flights since 1989. Operated in solar absorption mode, each measured spectrum covered the entire 650-5450 cm^{-1} spectral region at 0.01 cm^{-1} resolution. Least squares fitting of computed spectra to those observed was employed to quantify over 20 different atmospheric gases simultaneously including HCN, CH_4, N_2O, OCS, CHF_2Cl, CF_2Cl_2, $CFCl_3$, CCl_4, O_3, NO, NO_2, HNO_3, N_2O_5, $ClNO_3$, HOCl, HCl, HF, COF_2, CO, C_2H_6, H_2O, HDO, N_2, O_2 and CO_2. The data reduction process will be described and the major sources of error will be examined. In particular, the last three named gases, having well known atmospheric abundances, are important in establishing the true observation geometry and temperature profile, which otherwise are major sources of uncertainty. Data taken during balloon ascent, sunset, sunrise and balloon descent have been separately inverted to yield sets of volume mixing ratio profiles over the 15-45 km altitude range. These not only provide diurnal information on the short-lived species, but also test the consistency of the other long-lived gases.

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